PASSENGER CHECK-IN AND MONITORING SYSTEM

This invention relates to a passenger check-in and monitoring system for use at any location from which passengers can depart on their travels. It is thought that the invention will have particular application at Airports but it is not to be construed as being limited to this application.

Usually when travelling, a passenger will purchase a travel ticket prior to arrival at the departure location, for example an Airport, or alternatively may purchase a ticket from sales staff at the chosen departure location. In most circumstances, it is usual when the ticket is purchased, for the passenger details and travel details to be retained in a central database which is accessible by both the Airline with whom the passenger is travelling and the Airport authorities. The database is also accessible by both Airline sales staff and travel agents for booking purposes. Thus when a passenger enters an Airport to travel, a check-in process must be completed wherein the details held on the ticket, and the passengers identity, are checked against the details held in the database and, if they are correct and match, a boarding card is issued to the passenger to enable them to board the desired flight.

However, problems arise with such conventional check-in procedures insofar as the manual processing of check-in by Airport staff is time consuming and therefore it is not unusual for significant queues to form at check-in positions which has a deleterious effect on passengers.

A further problem which arises with conventional cheek-in systems is that, after having left the check-in position, it is not possible to know at any one time where each individual passenger is located. For effective security it can be advantageous to be able to monitor the whereabouts of passengers within the Airport buildings.

It is accordingly the object of the present invention to provide a passenger check-in and monitoring system in which the need for time consuming manual processing at check-in can be obviated or at least

minimised. It is a further object of the present invention to provide a system in which the location of any one or more passengers within the Airport can be monitored at all times.

Thus and in accordance with the present invention there is provided a passenger check-in and monitoring system comprising a memory device containing travel and passenger information issued to a passenger when purchasing a travel ticket, a data storage device containing information relating to all available travel and passenger information and a plurality of transmitter devices operable to allow exchange of information between said memory device and data storage device.

With this arrangement it is possible to speed up check-in procedures and also increase security by allowing continuous monitoring of the location of passengers who have checked in.

The invention will be described further by way of example only and with reference to the accompanying drawings in which:

FIGURE 1 shows in diagrammatic form, one embodiment of a system in accordance with the present invention;

FIGURE 2 shows one example of the system of Figure 1 in use, in diagrammatic form; and

FIGURE 3 shows one example of how antennas can be positioned in a system of the kind of the present invention.

Referring now to Figure 1, there is shown one example of the system accordingly to the present invention.

The system includes a memory device 10 which is linked to a passenger travel ticket 11 and a data storage device 12 which contains all data relating to travel and passenger information.

The system also includes a plurality of antennas 13 to allow exchange of data between the data storage device 12 and the memory device 10.

The memory device 10 comprises an electronic tag, preferably a Radio frequency tag, which may be provided as an integral part of the passenger travel ticket or may be formed as a separate part attached or linked thereto. Data is stored digitally in the tag and is interrogated by radio frequency signals from the antenna 13.

The data storage device 12 comprises a microprocessor based system or computer system upon which data relating to all available flights and details of passengers booked to travel on those flights is stored.

The antennas 13 comprise conventional radio frequency antennas and are designed to facilitate the transmission of data from the tag 10 to the data storage system 12 and vice versa. The antennas 13 are provided at specific locations around the Airport building in a manner which will be described hereinafter.

In use as shown in Figure 1, a passenger 14 who wishes to purchase a ticket to, for example fly to a particular desired location will approach a member 16 of the Airline staff at the Airport or a travel agent in a travel agents premises. The person 16 from whom the passenger is buying the tickets will enter the flight details and data regarding the identity of the passenger into an input device 17 for example, in the form of a computer terminal. The computer terminal 17 is linked to the central data storage system 12 which contains all flight details and passenger details for all flights. Once the usual checks have taken place, the passenger 14 is issued with a ticket 11 which has integrally formed therein an electronic tag 10. The flight and passenger details are transmitted by the central data storage system 12 using the antenna 13 to the tag 10 on the ticket 11. The ticket 11 issued to the passenger 14 will, in these circumstances, hold information regarding the passenger's travel plans and also the passenger's identity. The information is transmitted from the data storage device 12 via the antennas 13 to the tag 10 on the passenger ticket in digital form, preferably at radio frequencies.

Once the passenger has been issued with a ticket for his chosen flight, the passenger 14 will travel to the Airport and will enter into a check-in area 21 as shown in Figure 2. The passenger 14 may for example enter the check-in area using an entrance "A" and provided adjacent to the entrance are antennas 13 which read the data stored on the passenger ticket and pass this data, along with the fact that the passenger has passed through that area, to the central data storage 12. In practice, passengers 14 will only be able to move around the check-in area of the Airport in a predefined route in order to ensure that their movements can be tracked. Having passed through the entrance 'A' into the check-in area 21 the passenger will take a seat in a check-in waiting area 22. Bearing in mind that information has been passed to the central data storage system 12 that the particular passenger 14 has entered the check-in area 21, this information can be relayed to check-in staff 23 to allow them to check-in passengers sequentially as they arrive or to prioritise passengers for check-in on any suitable basis. Thus, when it is a particular passengers turn to be checked in by the check-in staff 23, his details will appear on for example a screen display 24 provided in the seating area 22 which indicates that a particular check-in position 15 is available for checking in of that passenger. The passenger will follow route "B" shown in Figure 2 to the check-in terminal 23 and the passengers passage along this route may be monitored by suitably placed antennas 13 (not shown) which transmit to the central data storage system 12 that the passenger 14 has passed through route "B" to the check-out desk. If it is desired to prioritise one passenger as regards other passengers who have passed into the seating area 22 of the check-in lounge 21, this can be done and the prioritisation can depend on the time the passengers entry into the cheek-in area as compared with the departure time of the passenger's flight. For example, the closer the time of departure to time of entry of the passengers, the higher the priority to process the passenger. Thus, for example, the check-in staff's check-in

system 23 may form a virtual queue which allocates each passenger to a position in the queue based upon their priority.

Once the passenger 14 has passed to the check-in position, the passenger will be checked in accordance with normal Airport and Airline procedures and will then be issued with a boarding card which will also contain an electronic tag upon which flight and passenger information is stored. Having checked in for the flight successfully, the passenger will then exit via route "C" to the departure and gate area and once again passes through antennas 13 which read the tag on the boarding card and update the central data storage 12 as to the fact that the passenger has passed from the check-in area into the departure lounge.

An advantage of the system as described above is that as the passenger and flight details on the ticket 11 are scanned and updated upon entry into the check-in area, upon passage from the check-in area to the check-in desk and from the check-in desk into the departure lounge, if a person who is not authorised to be in any particular area is detected in that area then appropriate action can be taken. As for example if a passenger either deliberately or inadvertently attempts to enter the check-in lounge 21 and pass to the departure lounge without checking in, this would be detected by the antennas 13 placed at route exit "C" which would detect the fact that the passenger has not been checked in at the checking desk since the update provided to the tag and check-in would not be present on that passenger's card. Furthermore, once a passenger has been checked in, the check-in system 23 will automatically update the central data storage 12 and this will automatically cause the next passenger listed in the virtual queue to be advised via the display 24 at the seating area 22 that a check-in desk is available for checking in.

Obviously, it will be appreciated that with the system as described above, a passenger's route through the check-in desk to the departure lounge can be monitored very easily and conveniently and furthermore the position of the passenger in the check-in area can be monitored precisely.

However, there is the situation of when the passenger is not in the check-in area. This can be solved by linking to the central data system 12 a series of strategically placed antennas 13 throughout the Airport building can monitor where any particular passenger is at any particular time. As shown in Figure 3, a series of antennas 13 can be mounted in any one area which can ensure that the entire area is monitored such that the position of a passenger can be identified precisely. In the examples shown in Figure 3, the antennas can be mounted in the ceiling and walls and doorways so as to ensure total coverage. If a passenger is detected in an area where he should not be, or no signal is detected from that ticket for a given time, this can cause a suitable security alarm to be generated which is passed to Airport security staff.

It will be appreciated that the system of the present invention offers significant advantages over existing check-in and security staff insofar as the check-in procedure can be considerably streamlined and semi-automated and security can be considerably improved by allowing constant real time monitoring of passenger movement.

It will of course be understood that the invention is not intended to restrict to details of the above embodiment described by way of example only.

Thus for example, the system of the invention can be modified to allow detection of a passenger entering the check-in area where no tag 10 is detected or the radio frequency signal from the antennas cannot reach the tag to interrogate the tag for example due to the signal being blocked by luggage or other structures. The modification may comprise an additional optical or other suitable sensor at entrance "A" shown in Fig. 2.

The optical sensor will detect the entry of a person into the check-in area and, if no tag is detected at the same time by the antenna, the central storage device 12 will detect the absence of a tag 10 and can alert security staff in any suitable manner.

Further, it is also possible to arrange for display on display 24 the identities of all passengers where tags have been detected by the antennas and passengers can be suitably instructed, upon entry into the check-in area, to check the display 24 to ascertain whether their tag 10 has been detected and, if not, to alert airport staff to the fact.

Still further, it is of course possible to attach similar tags 10 to luggage intended for the hold or hand baggage. The tag 10 can be incorporated within, or otherwise associated with or attached to conventional luggage labels applied to baggage, including hand luggage, during check-in. Luggage information can therefore also be stored in the central data storage device 12 thereby allowing luggage also to be associated with a particular passenger or group of passengers; if for example, when a family checks-in with luggage common to all of them. The data relating to the luggage can be associated with the family rather than an individual member of the family. If the luggage and passenger or associated passenger are detected in different locations, then the data storage device 12 could be set to generate a security alert. Additionally if either one, or both, of the passenger or associated luggage is not detected at all, then the data storage device 12 could be set to generate a security alert. If desired the data storage device 12 could also detect via tags 10 and antennas 13 if the person currently carrying luggage is not the person originally associated with the luggage. This can be achieved by comparing tag data from the ticket or boarding card, with that from the luggage tag. Where RF tags 10 are attached to luggage, a closed circuit arrangement can be used which is opened if the tag is removed from the luggage. The open circuit can be detected using antennas 13 and an alert can be raised by the data storage device 12. As the data storage device 12 will know the passenger or group of passengers to whom the hand luggage was originally associated, the monitoring of hand luggage will if desired, enable rapid and remote identification of unattended hand luggage. This would for example, be useful in dealing with unattended

luggage which could be a potential bomb threat, by allowing staff to interrogate the data storage device 12 to identify and locate the passengers who are responsible for the hand luggage. Also as the data storage device 12 will know the location and passenger association of the hand luggage, by interrogating the central data storage device 12, it will be easier to find items of lost hand luggage and attribute them to the passenger or passengers originally associated with them.

Still further the invention may be facilitated by providing appropriate staff with portable antennas 13 that communicate with the data storage device 12 via wireless means and also provide the user with the facility to interrogate the data storage device 12.

Futhermore, it would be possible if desired, for the data storage device 12 to reconcile all airport users and hand luggage entering the airport or a zone within the airport, with all airport users and hand luggage exiting the airport or zone within the airport. The system of the invention is therefore self checking. Any airport users or hand luggage that do not comply with this self-checking rule can if desired, cause the central data storage device 12 to generate an alert.

Furthermore, it may be desired to monitor the movements of Airport staff and, in these circumstances, each member of staff can have an RF tag 10 integrated into or otherwise associated with their staff identification card. The RF tag 10 can contain information such as staff name, duties and the areas in which they are authorised to perform their duties.

Furthermore RF tags 10 can be integrated or otherwise associated with any form of personal identification carried by persons using or working in the Airport to enable monitoring to take place; this if desired, could include passports and identity cards.

As a further alternative, the central data storage device 12 could include one or more neural networks to build up and maintain,

automatically, the expected patterns of behaviour of airport user movements in an expected behaviour model. The movement of airport users (all bearing RF tags 10) could be measured to build a model of airport user behaviour. The expected behaviour model can be measured using mathematical parameters for example:

Average time spent in a particular zone

Normal movement sequence point to point within the airport with respect to flight time and gate number for passengers

Average time required to get from current point in the airport to flight gate

Normal movement sequence point to point with respect to work duty behavioural patterns for airport staff

Furthermore the data storage device 12 could constantly compare expected versus actual airport user behaviour as detected by the antennas 13. Any deviations from expected behaviour will be determined by the data storage device 12 and if desired, can generate an alert in appropriate circumstances. Although security alerts could be generated for every deviation from expected behaviour patterns, it may be desired that the alerts are assessed or scored by the data storage device 12 and subject to tolerance filters to minimise false alarms. The data storage device 12 could if desired, be provided with tolerance parameters that can be amended as appropriate for each kind of deviation from expected behaviour.

Furthermore, as the data storage device 12 will know the details of airport users and these details are encoded on an airport user's RF tag 10, the data storage device 12 could discriminate between categories of airport user for example:

Passenger, adult, male

Passenger, adult, female

Passenger, child, male

Passenger, child, female

Airport staff, job type

If desired, each category of airport user could have their own expected behavioural pattern stored within the central data storage device 12 against which airport users within each category could be assessed. In combination with the tolerance filters mentioned earlier, this could provide further refinement and reduce false alarms still further.

Furthermore the data storage device 12 could be set to track targeted airport users continually. This would have the advantage of providing information regarding for example:

Airport users known to the authorities

Airport users in high risk categories

Passengers who may require additional help during their transit through the airport

If desired, targeted airport users could be monitored continuously in real time by the data storage device 12, with instant reporting of current position and movements. Also, targeted airport user movements could be recorded by the data storage device 12, analysed and used as evidence. Additionally, targeted airport users will be unaware of being actively monitored by antennas 13 and data storage device 12, thus reducing the risk of airport users absconding or otherwise losing track of them.

As a further alternative, it may be desired that the airport is compartmentalised into zones, antennas 13 being located at each zone's entrance and exit points, the zones parameters being stored within the data storage device 12. This would help to trace airport users to specific areas within the airport.

As a further alternative, the airport information stored within the data storage device 12 could also include data regarding the average time that

it would take the average passenger to move from each location in the airport to a boarding gate. The correlation of this information together with the current actual location of passengers and the time of departure could be used by the central data storage device 12 to identify passengers who are likely to be late and alert the airline to take appropriate action.

Furthermore, passenger movements detected by the data storage device 12 via antennas 13, could be correlated with the expected behaviour model in the data storage device 12 to identify passengers whose movements indicate that they may be lost (a security alert could also be generated). This could, if desired be used by airlines to provide assistance and pre-empt any lateness. Airlines could if desired, interrogate the data storage device 12 to locate passengers to a particular airport position or zone. Also, if desired the data storage device 12 could be used at critical times before a flight's departure to help ensure that passengers board an aircraft on time. Interrogation of the data storage device 12 would be possible to identify passengers' locations within the airport after the gate has opened. After a flight is called, passengers known by the data storage device 12 to be in shops or bars within the airport could be monitored to ensure that they start to make their way towards the boarding gate. The data storage device 12 could if desired be set to determine where passengers fail to respond to the boarding call and generate appropriate alerts. Thereafter, measures could be taken to alert specific passengers for example zone specific tannoy announcements. In addition, the data storage device 12 could generate an alert for passengers who have been detected as moving in a direction away from the boarding gate after it has opened for example moving into a bar rather than leaving the bar. Additionally when boarding commences, the data storage device 12 may be used to identify people, particularly minors, who are missing from the boarding area and trace them, via their last detected movements, to specific airport locations. Again, this would be a useful source of information for the airlines. It may be desireable to

implement a general rule within airports where the system of the invention has been implemented, that tickets or boarding cards (with integrated tags 10) must be shown prior to any transaction at airport facilities or commercial establishments. This measure would help to ensure that passengers keep tickets and boarding cards on their person. It should be noted however that if a passenger deliberately or inadvertantly discards their ticket or boarding card, the lack of movement of the ticket or boarding card would fall outside the expected pattern of behaviour and would be detected by data storage device 12 which would generate an alert.

Also, data gathered by the data storage device 12 relating to airport users' movements could be useful for commercial purposes. For example, shop visits and purchases can be monitored and correlated with flight destinations, passenger sex and purchases made.